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REMARKS

An excess fee payment letter is submitted herewith for one (1) excess independent claim and (12) total excess claims.

Claims 1-32 are all the claims presently pending in the application. Claims 1-8 and 10 stand rejected on prior art grounds and claims 5, 7-9, and 11-19 stand rejected for informalities. Applicant gratefully acknowledges that claims 9 and 20 are allowed and that claims 11-19 would be allowable if rewritten in independent form. Claim 8 is amended to conform to allowable claim 19, and claim 11 is rewritten into independent form. Further, Applicant respectfully submits that all of the claims are allowable and reserves the right to rewrite allowable claims 12-20 into independent form later.

This Amendment amends claims 1, 5, and 7-11. Claims 21-32 were added to claim additional features of the invention. Attached hereto is a marked-up version of the changes made to the claims by the current Amendment.

It is noted that the claim amendments are made to merely clarify the language of each claim, and not for distinguishing the invention over the prior art, narrowing the claims, or for any statutory requirements of patentability. It is further noted that, notwithstanding any claim amendments made herein, Applicant's intent is to encompass equivalents of all claim elements, even if amended herein or later during prosecution.

Regarding the prior art rejections, claims 1-7 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Ichikawa et al (Ichikawa) (U.S. Patent No. 5,757,250). Claim 10 stands rejected under 35 U.S.C. § 102(b) as being anticipated by both Fukatsu et al (Fukatsu) (JP 5-55866) and Akahori (JP 6-132759). Claim 8 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Morizaki (JP 2000-196408) in view of Uda et

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al. (JP 9-186550).

The rejections are respectfully traversed in view of the following discussion.

I. THE CLAIMED INVENTION

Applicant's invention, as disclosed and defined in claim 1, is directed to a surface acoustic wave (SAW) filter device with a chip substrate of a piezoelectric material, which includes a plurality of interdigital transducers accommodated in a plastic package and a terminal member connected to the plastic package. The terminal member comprises a lateral extending portion recessed into the package which contacts the back surface of the chip substrate.

An important aspect of the invention is a common potential device for providing a common potential in the interdigital transducers, a charge neutralizing device for neutralizing charge generated on the chip substrate due to polarization, or a charge escape device for causing escape of charge generated on the chip substrate due to polarization, that is provided as an electric discharge preventing device for preventing electric discharge among the plurality of interdigital transducers on the chip substrate.

As a result, the present invention prevents destruction of the interdigital transducers due to charge generated by polarization in cases when mounting a SAW filter on a substrate or while testing the SAW filter device.

In complete contrast, a conventional SAW filter uses either a ceramic package with a grounded metal film or a plastic package without a metal film. Due to the problem with securing metal to plastic, it is difficult to provide a device for permitting the escape of charge generated due to polarization on a plastic package.

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The claimed invention, however, uses an electrical discharge preventing device for preventing electric discharge among a plurality of interdigital transducers combined with a plastic package to allow escape of charge from the transducers.

Specifically, the package of the claimed invention for accommodating a SAW filter formed on the front surface of a chip substrate includes a plurality of terminals extending out of the package and extending into the package, wherein one of the terminals comprises an L-shaped portion and the back surface of the chip substrate contacts the L-shaped portion.

II. THE PRIOR ART REJECTIONS

THE ICHIKAWA REFERENCE

The Examiner alleges that claims 1-7 are anticipated by Ichikawa under 35 U.S.C. § 102(b). Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by Ichikawa.

Ichikawa discloses a system of using an extremely thin film with high resistivity formed on a substrate to adjust the operational frequencies of a surface acoustic wave filter (col. 15, lines 56-60). Aluminum electrodes are formed on the filter substrate after forming high resistant silicon-oxide thin film 47 on the surface of a LiTaO₃ substrate (col. 16, lines 6-8).

As is clear, Ichikawa teaches different objectives and matters from those of the present invention. The goal of Ichikawa is to form an oxide thin film on at least one section of the substrate so as to differentiate the transmission velocity of the surface acoustic wave (col. 2, lines 24-27) and to have electrodes that cannot be broken during the

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separation process from a sheet and a wide adjustment range for operation frequency (col. 2, lines 15-20).

To form the SAW filter, Ichikawa teaches fixing the substrate inside a ceramic holder 34 (Fig. 9C). As a final step, a sealing window 36 is formed by using a transparent material such as quartz, thus packaging the filter (Fig. 9E). The holder 34 is composed of materials to pass light, heat rays, or an electromagnetic wave, namely “glass materials including dissolved quartz,” (col. 15, lines 6-8).

The claimed invention, however, provides a structure capable of preventing electric discharge among the plurality of interdigital transducers on the chip substrate due to polarization when mounting the SAW filter on the substrate or testing the same. Further, the invention has a plurality of interdigital transducers accommodated in a plastic package, as disclosed in claim 1. The plastic package and filter have elements capable of permitting escape of charge generated due to polarization (Application, p. 4, lines 12-30). The invention uses the effect of a thin film formed between the interdigital transducers and chip substrate of the filter, combined with a terminal ground member that extends into the plastic package and connects to the back side of the chip substrate, to prevent electric discharge among the transducers, thereby damaging the SAW filter.

Regarding the rejection to claim 1, the Examiner alleges that column 14, lines 54-63 and column 15, lines 1-8 teach an SAW filter accommodated in a package (see e.g. Figures 11D-11G) wherein the package has cover 36 and body 34 and is formed of a transparent material including plastics. However, Ichikawa discloses a fixed ceramic holder 34 (Fig. 9C, 11D) and has a sealing window 36 formed by using a transparent material, such as quartz, to package the filter (col. 13, lines 28-33).

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Ichikawa does not teach or suggest the claimed elements of “a plurality of interdigital transducers accommodated in a plastic package” as recited in claim 1.

In contrast, Ishikawa’s disclosure for using “plastics” in a filter is merely an alternative transparent material to the sealing window 36, not the entire package. Ichikawa states “the frequencies of SAW element [sic] also could be adjusted precisely if the glass material like dissolved quartz for the sealing window 36 was replaced with the following materials . . .” (Ichikawa, col. 14, lines 54-63) and proceeds to list alternative materials for the window 36.

Further, there is no teaching or suggestion in Ishikawa of “a terminal member connected to said plastic package, wherein said terminal member comprises a lateral extending portion recessed into said package which contacts the back surface of the chip substrate,” as recited in claim 1. Ishikawa makes no disclosure or suggestion of a package structure having terminals extending into the package that contact the back surface of the chip substrate.

Implementing a plastic package in the claimed invention is not trivial. It is difficult to form a metal film by plating or deposition on the plastic. Therefore, to use a plastic package and permit escape of electrical charges generated due to polarization, it is important that the structure of the chip substrate of the SAW filter be free from polarization or capable of permitting escape of charges (see generally Application, p.3, lines 25-30 to p. 4, lines 1-10).

The Examiner alleges that column 15, lines 55-60 and column 16, lines 6-8 of Ishikawa disclose “an electric discharge preventing means” that is realized by a high resistivity film 47. The Examiner further alleges Ishikawa teaches that the film is

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provided between the chip substrate 41 and interdigital transducers 42 and 44 (see col. 17, lines 13-25, 38-41, Figs. 13E-13G) and is therefore, also a charge neutralizing means.

Although Ishikawa discloses a thin film between transducers and the substrate on an SAW filter, any resemblance to the present invention ends there. There is no teaching or suggestion by Ishikawa of the invention as a whole of a SAW filter with a plastic package, as discussed above, that also includes “a terminal member connected to said plastic package, wherein said terminal member comprises a lateral extending portion recessed into said package which contacts the back surface of the chip substrate,” working in conjunction with “a common potential means for providing a common potential in the interdigital transducers, a charge neutralizing means for neutralizing charge generated on the chip substrate due to polarization, or a charge escape means for causing escape of charge generated on the chip substrate due to polarization . . . as an electric discharge preventing means for preventing electric discharge among the plurality of interdigital transducers on the chip substrate,” as recited in claim 1.

The disclosure by Ishikawa does not teach or suggest an electric discharge preventing means, such as a thin film between transducers and the chip substrate, combined with a plastic package having a terminal connected through a lateral member inserted into the package connected to the back of the chip substrate.

On the contrary, Ishikawa is basically the structure of the prior art discussed in the specification of the present Application. In the prior art (see Application, p. 3), “to prevent the electric discharge among the interdigital transducers, a ceramic package 91, as shown in Figure 13, is used to accommodate the SAW filter. The package has a metal film, 92 . . . on its inner bottom surface. More specifically, the ceramic package 91

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used for accommodating the SAW filter 100 is such that the bottom surface of the chip substrate of the SAW filter 100 is in contact with the metal film 92 when the SAW filter 100 is accommodated,” (lines 10-25) (emphasis Applicant’s).

The present invention overcomes the limitations of Ishikawa and other prior art, i.e. ceramic package (Ishikawa, col. 14, lines 15-20) combined with only a metal film on the bottom of the substrate (Ishikawa, col. 16, lines 5-10) by providing “a terminal member connected to said plastic package” which “contacts the back surface of the chip substrate,” and is combined with “an electric discharge preventing means for preventing electric discharge among the plurality of interdigital transducers on the chip substrate,” as recited in claim 1. Specifically, a common potential means, a charge neutralizing means or a charge escape means is used in combination with a plastic package, wherein a ground terminal member comprises a lateral extending portion recessed into the package and contacts the back surface of the chip substrate.

Thus, turning to the exemplary language of claim 1, there is no teaching or suggestion of a SAW filter device with a chip substrate of a piezoelectric material, that includes *“a plurality of interdigital transducers accommodated in a plastic package; a terminal member connected to said plastic package, wherein said terminal member comprises a lateral extending portion recessed into said package which contacts the back surface of the chip substrate, wherein a common potential means for providing a common potential in the interdigital transducers, a charge neutralizing means for neutralizing charge generated on the chip substrate due to polarization, or a charge escape means for causing escape of charge generated on the chip substrate due to polarization, is provided as an electric discharge preventing means for preventing electric discharge among the*

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plurality of interdigital transducers on the chip substrate,” (emphasis Applicant’s).

THE FUKATSU AND AKAHORI REFERENCES

The Examiner alleges that claim 10 is anticipated by each of the Fukatsu and Akahori references under 35 U.S.C. § 102(b). Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by Fukatsu or Akahori.

Applicant has incorporated allowable subject matter identified by the Examiner into claim 10. Specifically, the elements “a plurality of terminals extending out of the package and extending into the package, wherein one of said terminals comprises an L-shaped portion, and wherein the back surface of said chip substrate contacts said L-shaped portion,” are incorporated into claim 10. Therefore, applicant submits that the rejections to both Fukatsu and Akahori are rendered moot.

Thus, turning to the exemplary language of claim 10, there is no teaching or suggestion of “a package for accommodating a surface acoustic wave (SAW) filter formed on the front surface of a chip substrate, comprising: a plastic molding formed as a rectangular planar shape having a front surface, a back surface, an edge wall, and a central rectangular recess for receiving said SAW filter; a plurality of terminals extending out of the package and extending into the package, wherein one of said terminals comprises an L-shaped portion, and wherein the back surface of said chip substrate contacts said L-shaped portion.” (emphasis Applicant’s).

For at least the reasons stated above, Applicant respectfully submits that the cited references fail to teach or suggest every feature of independent claims 1, 8, 10 and 11.

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Claim 8 conforms to allowable claim 19, thereby rendering moot the rejection to claim 8. Furthermore, Applicant submits that claims 2-9 and 12-18 are patentable not only by virtue of dependency from independent claim 1, respectively, but also by the additional limitations they recite.

Based on the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections.

III. INFORMAL MATTERS AND CONCLUSION

Proposed drawing corrections to figures 12-14 designating them as "Prior Art" are submitted herewith. Formal drawings incorporating such proposed changes will be submitted upon reception of notice of allowance of the Application.

The specification has been amended to overcome the Examiner's objection for informalities. Additionally, on page 18, line 15 the "dummy electrode pattern" is correctly labeled with the reference number "5," and on page 21, the specification describing a "portion" of the package was amended to reflect reference label "79."

To overcome the Examiner's objection to claim 11, claim 11 incorporates elements from independent claim 1 to form an independent claim. Claim 5 is was amended to overcome the Examiner's objection as being substantially identical in scope to claim 6.

In view of the foregoing, Applicant submits that claims 1-32, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to withdraw the rejection and pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for

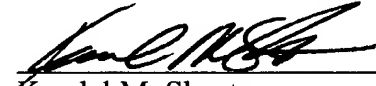
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allowance, the Examiner may contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorneys Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 4/30/03


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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Please replace the paragraph, beginning on page 3, line 27 and continuing to page 4, line 10, with the following:

A plastic package may be used to reduce the cost of the SAW filter. However, it is difficult to form a metal film by plating or deposition on the plastic package. That is, it is difficult to provide, on the package, a means for permitting escape of charge generated due to polarization. It is therefore inevitable, as shown in Fig. 14, [packaging of the SAW filter] that the SAW filter be packaged without presence of any metal film between plastic package 7 and SAW filter 100. In order that the plastic package 7 can be used, it is important that the structure of the chip substrate of the SAW filter 100 is free from polarization or capable of permitting escape of charge generated due to polarization.

Please replace the paragraph beginning on page 4, line 12, with the following:

An object of the present invention, accordingly, is to provide an SAW filter device, which has a structure capable of preventing destruction of the interdigital transducers by charge generated on the chip substrate due to polarization in such case as when mounting the [FAW] SAW filter on substrate or when testing the same.

Please replace the paragraph beginning on page 6, line 4, with the following:

SAW filter device according to a preferable embodiment has a SAW filter having the electric discharge preventing means formed on the chip substrate and accommodated in the above package. Since the bottom surface of the chip substrate is in contact with the

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metal plate portion, charge generated due to polarization thus is not concentrated on the side of the SAW filter chip substrate surface but is neutralized[, even generated].

Please replace the paragraph beginning on page 9, line 7, with the following:

The high resistivity thin film 2 is formed by deposition or [sputtering] sputtering on the chip substrate 1. The interdigital transducer material is formed by, for instance, [sputtering] sputtering Al. Then, a photo-resist is coated, and patterned by an exposure device or the like. After the photo-resist on unnecessary portions is removed, the interdigital transducers 11 to 14 are formed. Alternatively, after forming the high resistivity thin film 2 on the chip substrate 1, a predetermined photo-resist may be provided, and then the interdigital transducer material, such as Al may be formed. The SAW filter as shown in Fig. 1 can be obtained by the above described process.

Please replace the paragraph beginning on page 11, line 12, with the following:

As an example, after the formation of the interdigital transducers 11 to 14 on the chip substrate 1 by a [sputtering] sputtering technique or a photo-lithographic technique, the high resistivity thin film 2 is formed by deposition or [sputtering] sputtering on the [back] front surface of the chip substrate 1. As an alternative, it is possible to form the interdigital transducers 11 to 14 on the chip substrate 1 after the formation of the high resistivity thin film 2.

Please replace the paragraph beginning on page 15, line 10, with the following:

Fig. 5 (A) is a plan view showing a fifth embodiment [of the fifth embodiment] of

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the SAW filter according to the present invention. Fig. 5(B) is a sectional view taken along line B-B. The fifth embodiment of the SAW filter, which has the interdigital patterns 11 to 14 formed on the chip substrate 1 of a piezoelectric material, also has a film 3 of a metal or like conductive material covering an edge portion of the front surface of the chip substrate 1. The conductive material from 3 does not cover the portion constituting a surface wave propagation path in the SAW filter.

Please replace the paragraph beginning on page 18, line 11, with the following:

Patterns as second patterns 52 having the same line width as the first pattern 51, are formed such that each forms a gap 53 formed between it and the first pattern 51. Dummy electrode patterns 5 are formed such that they are each connected to each pattern 5. The gaps 53 have a width (i.e., the spacing between the patterns 51 and 52 is narrower than the spacing between each of the interdigital transducer 12 and 14. The patterns 51 and 52 have a line width narrower than the pattern width of the interdigital transducers 11 to 14.

Please replace the paragraph beginning on page 21, line 24 and continuing to page 22, line 2, with the following:

The package 7 has a plurality of pads 71a to 76a formed on a portion 79 defined between the edge wall 77 and the central recess 78. The package 7 further has metal terminals 71 to 76 extending from its inside to the outside. Of the terminals 71 to 76, the terminal 74 is used as a grounding terminal (GND terminal). The pads 71a to 76a are formed such that they are integral with the corresponding terminals 71 to 76.

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IN THE CLAIMS:

Please amend claims 1, 5, and 7-11, as follows:

1. (Amended) [An SAW] A surface acoustic wave (SAW) filter device with a chip substrate of a piezoelectric material [having] comprising:

a plurality of interdigital transducers [and] accommodated in a plastic package[,];
a terminal member connected to said plastic package, wherein said terminal member comprises a lateral extending portion recessed into said package which contacts the back surface of the chip substrate,

wherein [a] common potential means for providing a common potential in the interdigital transducers, [a] charge neutralizing means for neutralizing charge generated on the chip substrate due to polarization, or charge escape means for causing escape of charge generated on the chip substrate due to polarization, is provided as [a] electric discharge preventing means for preventing electric discharge among the plurality of interdigital transducers on the chip substrate.

5. (Amended) The SAW filter device according to claim 1, wherein the electric discharge preventing [mean] means is realized by [a film of a conductive material provided a front surface side edge portion of the chip substrate] opposed portions of the interdigital transducers having non-sharp shapes.

7. (Amended) The SAW filter device according to claim 1, wherein the electric discharge prevention means is realized by a high resistivity pattern provided [such] so as

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to surround [a front surface side edge portion] the front surface center portion of the chip substrate.

8. (Amended) [An SAW] A surface acoustic wave (SAW) filter device with a chip substrate of a piezoelectric material [having], comprising:
- a plurality of interdigital transducers and accommodated in a plastic package, wherein said plastic package comprises a terminal member made of metal extending out of the package and extending into the package such as to form an L-shaped portion, the chip substrate being accommodated in the plastic package such that the back surface of the chip substrate is in contact with the L-shaped portion, and
- wherein a first pattern as an extension of part of the interdigital transducers, a second pattern spaced apart from the first pattern and a dummy electrode pattern connected to the second pattern are formed on the front surface of the chip substrate as [the] an electric discharge preventing means for preventing electric discharge among the plurality of interdigital electric patterns.

9. (Amended) An SAW filter device with a chip substrate of a piezoelectric material having a plurality of interdigital transducers and accommodated in a plastic package, wherein [the] an electric discharge preventing means for preventing electric discharge among the plurality of interdigital electric patterns is realized by opposed portions of the interdigital transducers having non-sharp shapes.

10. (Amended) A package for accommodating [an SAW] a surface acoustic wave

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(SAW) filter formed on the front surface of a chip substrate [in the inside], [which comprises] comprising:

[a terminal member made of a metal] a plurality of terminals extending out of the package and extending into the package,

wherein one of said terminals [such as to form] comprises an L-shaped portion, and wherein the back surface of said chip substrate contacts said L-shaped portion.

11. (Twice Amended) [An SAW filter device including an SAW filter according to claim 1,]

A surface acoustic wave (SAW) filter device with a chip substrate of a piezoelectric material, comprising:

a plurality of interdigital transducers and accommodated in a plastic package,
[which comprises a plastic package including] said plastic package comprising a terminal member made of metal extending out of the package and extending into the package such as to form an L-shaped portion, the chip substrate being accommodated in the plastic such that the back surface of the chip substrate is in contact with the L-shaped portion,

wherein common potential means for providing a common potential in the interdigital transducers, charge neutralizing means for neutralizing charge generated on the chip substrate due to polarization, or charge escape means for causing escape of charge generated on the chip substrate due to polarization, is provided as electric discharge preventing means for preventing electric discharge among the plurality of interdigital transducers on the chip substrate.